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ABSTRACT

The basic question considered in this research practicum was did female students' participation in a special six-week mathematics clinic significantly reduce anxiety towards mathematics. Seventeen female participants completed both a pre and post Aiken-Dreger Math Attitude Scale. A t-test was used to compare the mean pretest and mean posttest scores. Results show that participation in the mathematics clinic significantly (.05 level) improved the attitude of the participants. (Author/MN)

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The Effects of a Mathematics Clinic on Reducing Anxiety in Female Students

SOCIETAL FACTORS

by

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York College of Pennsylvania

DR. KENNETH MILLER

EASTERN PENNSYLVANIA

A PRACTICUM PRESENTED TO NOVA UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF DOCTOR OF EDUCATION

NOVA UNIVERSITY

March 1978

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ABSTRACT

A Research Practicum Presented to Nova University
in Partial fulfillment of the Requirements
for the Degree of Doctor of Education

THE EFFECTS OF A MATHEMATICS CLINIC ON
REDUCING ANXIETY IN FEMALE STUDENTS

by

James G. Troutman

April 1978

SOCIETAL FACTORS EASTERN PENNSYLVANIA

York College of Pennsylvania has an "open door" admission policy. As a result of this policy students with varying backgrounds and abilities are matriculated at the College. Many students are admitted who would not otherwise have the opportunity to attend college. These students, more frequently than not, have a weak background in mathematics. In addition to the above students the college is also finding increasing enrollments of non-traditional students. Many veterans, full-time employees and homemakers are matriculating at the college. Rather than the problem of weak academic backgrounds these students face the problem of anxiety towards their chances of being successful in college.

This research examined the effects of a mathematics clinic on reducing anxiety in female students. The basic question asked was, did a student's participation in a special mathematics clinic significantly reduce her anxiety towards mathematics?

Participants completed both a pre and post Aiken-Dreger Math Attitude Scale. A t test was used to compare the mean pretest and mean posttest scores. The conclusion reached was that participation in the mathematics clinic significantly, .05 level, improved the attitude of the participants.

Some of the recommendations that were made as a result of this research included: the permanent establishment of a math clinic at York College; recommending further research in the areas of attracting students, in particular those with high anxiety towards mathematics, reduction of the attrition rate in the program, and visitation of other college's math clinics; the use of field trips, small class size, and informal teacher-student interaction as methods of presentation of material in the clinic.

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INTRODUCTION

York College of Pennsylvania is a private college in southcentral Pennsylvania with a full-time day enrollment of about 1900 students. In 1968 the present college was formed from York Junior College. The college has continued to show it's committment to the community by continuing the open admission policy for students graduating from York County high schools. In addition, there are special financial aid programs for many of these students.

As a result of the above policies the college admits students who would not otherwise have the opportunity to attend college. These students, more frequently than not, have weak backgrounds in mathematics. The students who lack the necessary qualifications are required to take an introductory course in mathematics.

In addition to the above students the college is also finding increasing enrollments of non-traditional students. Many veterans, full-time employees and homemakers are matriculating at the college. Although some of these students have weak academic backgrounds, most do not. These students face the problem of anxiety towards their chances of being successful in college. Typically, the student has been away from formal schooling for from four to twenty years.

Both the student who has been away from formal schooling and the entering freshman with a weak academic background often face a fear of mathematics. These students have feelings and attitudes towards mathematics that range from indifference to extreme anxiety. York College has a graduation requirement of six credits in mathematics. Thus both the requirement and the mathematics itself, become a source of anxiety. This anxiety constitutes an extra impediment to learning which adds to the frustration of finding the learning of mathematics difficult.

In addition to the aforementioned problems the fear of mathematics appears to be sex-linked in characteristic. The traditional societal influences on women seem to create a disproportionate number of math avoiding and/or math anxious females. One survey conducted at the University of California at Berkley by sociologist Lucy Sells (1973) found that 57 percent of the entering males had had four years of high school mathematics, while only 8 percent of the incoming females had had that much preparation.

Statement of the Problem

This research examined the effects of a mathematics clinic on reducing anxiety in female students. The basic question asked was, did a student's participation in a special mathematics clinic significantly reduce her anxiety towards mathematics. An underlying assumption was that the

reduction of mathematics anxiety would improve a student's chances of being academically successful in college mathematics courses and/or in a curriculum of her choice.

Significance to York College

It was hoped that the results of this research would indicate that a mathematics clinic would reduce a student's anxiety towards mathematics. A reduction in anxiety along with the accompanying improvement in academic achievement would increase the student's chances for success at York College. This in turn would reduce the rate of students who leave the college for academic reasons or a negative attitude towards mathematics. The clinic could also be used as an incentive for recruiting students who might otherwise not attend college due to their fear of mathematics.

In addition to the benefits of increased and maintained enrollments the college would also be meeting it's moral obligation to it's students. The institution would be affording each student the best opportunity for success in her academic pursuits.

Method of Investigation

During the first meeting of the Mathematics clinic the Aiken-Dreger Math Attitude Scale (Appendix I) was administered to all participants. Participants were also inventoried on their mathematics skills and the sources of their anxieties towards mathematics. At the final meeting of the math clinic, six-weeks later, the Aiken-Dreger Math Anxiety Scale was again administered to all participants.

Only those females completing both the pre and post Math Attitude Scales were included in this research. The arithmetic mean and standard deviation were calculated for both the pre and post test. A t test was utilized to compare the mean pre Math Attitude Scale score with the mean post Math Attitude Scale score. The hypothesis that was tested in null form was: there is no significant difference between the mean pre Math Attitude Scale score and the mean post Math Attitude Scale score. The level of significance for testing the hypothesis was .05 and it was designed as a one tailed test.

BACKGROUND AND SIGNIFICANCE

As will be seen in the review of the literature math anxiety seems to be a sex linked phenomenon. It is relevant to a study of societal factors, in that, the anxiety is caused by social pressures. This anxiety in females also causes social problems. In particular, the lack of a solid background in mathematics caused by this anxiety, serves to disqualify females from many career opportunities.

Review of the Literature

The literature suggest three areas of concern that apply to this research. First, there is a demonstrated relationship between attitude towards mathematics and achievement in that subject. Second, differences in attitude, ability, avoidance and anxiety appear to be sex linked. And third, lack of a solid background in mathematics serves to disqualify students from many professions. These areas will be considered in turn.

The assessment of attitudes towards mathematics would be of little concern if attitudes did not affect performance in some way. In a study by Neale (1969) he found that the relationship between attitudes and performance was the consequence of reciprocal influences. That is, attitude affected achievement and achievement in turn affected attitude.

Evidence from a variety of studies all show a significant positive correlation between self-reported attitude towards mathematics and standardized mathematics achievement test scores. Although many different test instruments and populations are used, results from studies by Aiken (1970), Aiken (1976), Anttonen (1967), Neale (1969) and Ryan (1968) are consistant in finding correlations above the .20 level.

Most researchers have argued that sex differences in learning mathematics have occured for either social of biological reasons. The biological reasons that have been given to account for these differences between the sexes in learning mathematics skills include differences in brain structure, genetic factors and hormonal factors. Saraga (1975) surveys the current literature in this area and remarks:

> It should be noted that the increasing interest shown in arguing the case for a biological basis for sex differences means that this work could be used in the future as an excuse or scientific justification for educational or social policies which discriminate against women.

It is not the concern of this research to study the biological bases for sex differences in learning mathematics. The social reasons are our concern.

Aiken (1970) surveyed the literature and listed four studies that showed a positive correlation between attitude towards mathematics and sex. He also found five studies that showed a positive correlation between

achievement in mathematics and sex. In an updated study, Aiken (1976) found four studies that showed no relationship between attitude towards mathematics and sex. He also found nine studies that showed a positive correlation between attitude towards mathematics and sex and noted that each of these studies concerned a population above the junior high school level.

The social reasons for sex differences have been researched by many authors. Donady and Tobias (1977) surveyed several studies and found that there are two myths concerning mathematics. First, males like math better than females, and second, males are naturally better at math than females.

Lynn Fox (1976) working at The Johns Hopkins University with mathematically gifted girls, reports that, "they find it difficult to continue with math due to the fear of social recrimination." Thus females seem to assume that math is "men's work" and thus unnecessary or unsuitable for them, while males assume they will need math in the future.

The myth that males are naturally better at math than females has been discredited by work done by Fennema and Sherman (1977). Their research has shown no significant difference between the math abilities of boy and girls who have taken the same mathematics courses. Their study included 589 females and 644 males, predominantly white,

and in 9th thru 12th grades. Few sex-related cognitive differences were found. However, many attitudinal differences were found. Their results showed relationships between socio-cultural factors and sex-related cognitive differences.

Lucy Sells (1976) found a strong relationship between social support from peers, parents, or teachers, and taking advanced mathematics in high school. She also found a strong relationship between reported social support for taking advanced mathematics courses, and the level of performance in those courses.

In an article by Sheila Tobias (1976) she offers the explanation that the ability to do mathematics beyond computation is correlated with the ability to do spatial relations. She reports that females at all ages tend to do more poorly than males on spatial relations.

After a lengthy discussion and a review of the literature on sex differences and the ability to be successful in science, E. Saraga (1975) concludes by writing:

> This discussion would seem to suggest two sorts of approaches that could be pursued in the short term: firstly attempts to reduce rigid sex role stereotyping in schools and to change girls'problem solving attitudes. Secondly attempts to change the 'masculine' image of science - school science text books might be a good place to start.

Finally, many researchers have seen the lack of a solid background in mathematics serving to disqualify

students from many professions. Lucy Sells (1975) reports that of a systematic random sample of freshmen admitted to the University of California at Berkeley, 57 percent of the males had three and one-half or more years of high school mathematics required for freshman calculus while only 8 percent of entering females had this requirement. She goes on to explain that the requirement of freshman calculus is needed in 75 percent of the curricula. Thus, the lack of a mathematics background is serving as a crucial filter to prohibit females from a freedom of choice in career opportunities.

The fact that females opt less for mathematics courses in high school is brought out in a study be Fennema and Sherman (Winter 1977). Their study of 2,919 girls and 3,347 boys enrolled in mathematics classes in four public high schools found that not only were there more boys enrolled overall, but more boys studied mathematics for a total of four years in high school. The difference was most striking in the fourth year mathematics courses. Gray (1977) points out that in some institutions women are effectively closed out of particular career options because they are not prepared for calculus courses.

Hedges and Majer (1976) studied 51,622 students enrolled at seven University of California campuses. Significant negative correlations were found between the number of math courses required by particular majors and

black females, chicano females and total females. No significant correlation was found for Asian females. The study confirmed that an underlying variable in the distribution of women students among disciplines is the mathematics requirements of the discipline.

Literature Summary

A survey of the current literature has pointed to the following conclusions:

1) There is a positive correlation between self-reported attitude towards mathematics and standardized mathematics achievement test scores.

2) Females tend to have a lower attitude towards mathematics than males.

3) Females tend to achieve less in mathematics than males. This is particularly true after the junior year in high school and is due to the fact that females opt for fewer mathematics courses than males.

4) Females face social pressures that encourage them to avoid mathematics and success in mathematics.

5) As a result of math avoidance in high school, females have limited curricula and career options in college.

6) As a result of math avoidance in high school females tend to have anxiety towards mathematics at the college level.

PROCEDURES

Definition of Terms

1) Anxiety - Measured by the Math Attitude Scale developed by Aiken and Dreger (1961) and revised by Aiken (1963). (See Appendix I.)

2) Dependent variable - Anxiety as measured by the Aiken-Dreger Math Attitude Scale.

3) Experimental group - A group of females volunteering to participate in the mathematics clinic.

4) Independent variable - Participation in the six-week mathematics clinic.

5) Intervening variables - age, intelligence, socio-economic status, curricular and extra-curricular activity and motivation.

6) Math clinic - A six-week anxiety reduction program patterned after the clinic developed by Sheila Tobias and used at Wesleyan University, Middletown, Connecticut. (See Appendix III for a syllabus.)

Procedures for Collecting Data

The math clinic was advertised in the greater York area and the surrounding counties. During December each freshman mathematics student was given a handout (See Appendix II) announcing the math clinic. During December and January, newspapers and radio stations in a twenty-five mile radius of York announced the math clinic.

During the week of January 23rd the math clinic met for the first time. During this session the Aiken-Dreger Math Attitude Scale was administered to all participants registering for the clinic. Participants were also inventoried on their mathematics skills and the cources of their anxieties towards mathematics.

The clinic was designed to parallel the math anxiety clinic developed by Sheila Tobias at Wesleyan University in Middletown, Connecticut. The course is designed to develop in students 1) a sense of competence in the acquisition of a body of important mathematics knowledge, 2) a lessoning of anxiety towards mathematics and quantitative fields, 3) a willingness to continue their study in such fields, and 4) an appreciation of the importance of some mathematical knowledge in their future careers. (See Appendix III for a syllabus.)

The purpose of the clinic is to show the student that mathematical anxiety is a curable disease. There will be an attempt to try to understand each student's problem and help alleviate her math anxiety. In addition to the traditional review of basic mathematics and number facts and algebra, the psychological and learning difficulties for mathematics were explored. There was discussion of mathematics experiences, feelings towards mathematics and the individuals self image vis-a-vis mathematics.

At the final meeting of the math clinic, during the week of February 27th, the Aiken-Dreger Math Attitude Scale was again administered to all participants.

Procedures for Treating the Data

1) Only those females completing both the pre and post Math Attitude Scale were included in the experimental group.

2) The mean and standard deviation of the pre Math Attitude Scale were calculated.

3) The mean and standard deviation of the post Math Attitude Scale were calculated.

4) A t test was utilized to compare the mean pre Math Attitude Scale score with the mean post Math Attitude Scale score. The following null hypothesis was tested:

There is no significant difference between the mean pre Math Attitude Scale score and the mean post Math Attitude Scale score.

The level of significance for testing ths hypothesis was the .05 level and it was a one tailed test at the 95th percentile value.

Null Hypothesis	$H_o: \bar{X} = \bar{Y}$
Alternate Hypothesis	$H_a: \bar{X} < \bar{Y}$
Level of Significance	$\alpha = .05$
Degrees of Freedom	16
Critical t Value	1.746

H_o must be rejected and H_a accepted if $t > 1.746$.

Reliability and Validity of Questionnaire

The Math Attitude Scale originally appeared in an article by Aiken and Dreger (1961). The Scale was revised by Aiken (1963). Like most researchers in math attitude, Aiken and Dreger choose a Likert type scale. The twenty item scale was developed from paragraphs written by 310 college students describing their attitudes towards mathematics. Ten of the items connote positive attitudes and ten connote negative attitudes towards mathematics.

Validity and reliability estimates were conducted by the authors, Aiken and Dreger (1961), and bases upon a sample of sophomores in a southeastern college. The test-retest reliability coefficient was reported at .94. Scores on the attitude scale were found to be significantly related to final grades of 67 females but not to the final grades of 60 males. Scores on the attitude scale were positively correlated with numerical ability but unrelated to specific general personality variables. In addition to content validity the authors claimed a degree of discriminant validity, that is, that attitudes specifically related to mathematics were measured by the scale.

Limitations

1) The extent to which the Aiken-Dreger Math Attitude Scale score accurately measures the students anxiety towards math limits the accuracy of the study.

2) The extent to which the Aiken-Dreger Math Attitude Scale determines attitude toward mathematics limits the accuracy of the study.

3) Any of the intervening variables may limit the accuracy of the study.

4) The general attitude and physical well-being of the subjects at the time the test is administered may limit the accuracy of the study.

5) Because of the small sample size, nineteen, there is a possibility of erroneous results.

6) The extent to which the participants in this study reflect the characteristics of future students at York College affects the internal generalization of results.

7) The extent to which York College compares to other colleges limits the external validity of this study.

8) The mathematical background of the participants may affect their attitude towards mathematics.

9) The fact that the participants are volunteers may affect the results of the study.

10) The fact that there is no control group limits the use of this study as an experimental design.

Basic Assumptions

1) It was assumed that the limitations would not adversely affect the results of this study.

2) It was assumed that the possible intervening variables would not adversely affect the results of this study.

3) It was assumed that students participating in this study would understand and accurately respond to the survey instrument.

4) It was assumed that an improvement in attitude would improve the students chances for being successful in college mathematics.

5) It was assumed that the investigation of a small group of subjects would yield results indicative of a larger population.

6) It was assumed that the students volunteering for this study would have reasonable room for improvement of their attitude towards mathematics.

7) It was assumed that an improvement in attitude would produce a reduction in anxiety.

RESULTS

Appendix IV contains the raw data for the participants in this study. The data includes age, I.Q., pretest score and posttest score for each participant.

Table I which follows contains product moment correlation coefficients for the given variables.

Table I

Correlation Coefficients

	Age	I.Q.	Pretest	Posttest	Diff
Age	1.000	-0.655*	-0.006	0.014	0.072
I.Q.		1.000	0.113	0.169	0.180
Pretest			1.000	0.963*	-0.291
Posttest				1.000	-0.024
Diff					1.000

* Significant at the .01 level.

Diff is the difference defined by the posttest minus the pretest.

A t test was used to test the following hypothesis: There is no significant difference between the mean pre Math Attitude Scale score and the mean post Math Attitude Scale score.

Null Hypothesis	$H_o: \bar{X} = \bar{Y}$
Alternate Hypotheiis	$H_a: \bar{X} < \bar{Y}$
Level of Significance	$\alpha = .05$

Degrees of Freedom	16
Critical t Value	1.746
One-tailed Test	.95 percentile value

H_o must be rejected and H_a accepted if $t > 1.746$. The results of the calculations are contained in Table 2 which follows.

Table 2

Statistics For
Aiken-Dreger Math Attitude Scale

Pretest Score	Posttest Score
$N_x = 17$	$N_y = 17$
$\bar{X} = 26.47$	$\bar{Y} = 31.71$
Min = 0	Min = 5
Max = 64	Max = 66
$\sigma_x = 18.11$	$\sigma_y = 17.33$
Calculated t value = 4.450	

The above table records the calculated statistics comparing the mean pre Math Attitude Scale score with the mean post Math Attitude Scale score. Designated respectively are: the number of students participating; the mean of the scores; the minimum of the scores; the maximum of the scores; and the standard deviation of the scores. Since the calculated t value of 4.450 exceeds the critical t value

of 1.726, the null hypothesis must be rejected. The researcher thus concludes that participation in the mathematics clinic significantly improved the mathematics attitude of the participants.

Table 3 which follows contains information on the participants. The minimum, maximum, mean and standard deviation are given for the age, I.Q., pretest, posttest, and posttest-pretest difference.

Table 3

Statistics For The Variables

	Min	Max	Mean	S.D.
Age	18	58	40.06	11.45
I.Q.	91	132	1 3.59	12.42
Pretest	0	64	26.47	18.11
Posttest	5	66	31.71	17.33
Diff	-1	17	5.24	4.85

DISCUSSION, IMPLICATIONS AND RECOMMENDATIONS

Discussion and Implications

Originally this research was to include both an experimental and a control group and thus be more experimental in nature. The experimental group was to receive the treatment of attendance at the mathematics clinic, while the control group was to receive no treatment. The design then would call for a t test between the mean of the pre post test differences of the two groups. The control group was to be matched to the volunteer experimental group by the matched pairs technique. The variables to be matched included age, I.Q. and pretest scores. As can be seen in Appendix IV and Table 3 the average age of the participants was over 40 years. On a college campus the size of York College it was not possible to find sufficient students in the appropriate age brackets in order to form a control group. It was therefore felt that the results of the study would be more meaningful by using a t test to measure the significance of the difference between the means of the pretest and posttest scores of the experimental group. Because of this the research is more descriptive than experimental.

The data given in Appendix IV and summarized in Table 3 describes the participants. The average age is

over 40 years, well above the mean of the age for college freshman. Although it is important to deal with the growing population of adult learners at York College the problem of attracting only two students below the age of 25 years must be considered.

Recommendation. Further research should be conducted to find methods of attracting more freshman to the mathematics clinic without jeopardizing the attendance of the adult learners.

The average I.Q. of the participants was almost 114 as measured by the Otis test. The range of the scores was from 91 to 132. The pretest scores ranged from 0 to 64 with a mean of 26.5 while the posttest scores ranged from 5 to 66 with a mean of 31.7. The difference as measured by the posttest minus the pretest had a rang of -1 to 17 with a mean of 5.24. Those participants in the above-40 age group had the highest rate of attendance. The mean difference of the above-40 age group was almost two full points higher than the corresponding increase for the below-40 age group.

It should also be noted that of the seventeen participants only one subject had a lower posttest score than pretest score and there was only a difference of one point. Also to be noted is the fact that originally 44 students registered for the mathematics clinic. Weather, job interference, and a flu outbreak cut this to a final

total of seventeen.

Recommendation. Further research should be conducted to examine how the attrition rate can be reduced. This is particularly important since improvement of the mathematics attitude of the student is the goal of this program and a high attrition and absentee rate is contrary to this goal.

The participants were invited to visit the computer center on campus. All of the subjects who attended this demonstration expressed strong interest in this area as well as a new found appreciation for data processing.

Recommendation. Future clinics should continue to use field trips and local tours where possible in order to increase awareness for the applicability of mathematics.

Many of the participants showed an appreciation for the informality of the lectures and the physical facilities including the use of a coffee and tea bar nearby. The subjects were in favor of the small class size (there were two sections for a total of 44 original students) and the informality between the teacher and students. Several student comments follow:

> "The opportunity to visualize and work through the various problems on the board together was helpful, especially the problems on the Otis test."

> "The opportunity to think and work together in a relaxed and nonthreatening manner without the frustation of taking exams, the result of which would pull my grade down was a great experience."

"This is great. 'Math Anxiety' explains it all - all aspects. I'd come again - very interesting sessions; each week it held your interest."

"Challenging - thinking type questions! Gives you insight of what actually can be accomplished by some people. Makes you say to yourself, if there is an answer and someone gets it, why then, can't I?

Recommendation. Future clinics should continue to use small class size and informal social interactions.

Table 2 records the statistics for the t test which concluded that the null hypothesis must be rejected and the alternate hypothesis accepted. Thus, participation in the mathematics clinic significantly, at the .05 level, improved the mathematics attitude of the participants. The results of the t test clearly indicate the need for a mathematics clinic.

Recommendation. The mathematics clinic should be permanently established at York College.

Much of the literature suggested that students with extreme high anxiety towards mathematics tend to avoid even a mathematics clinic.

Recommendation. Methods of identifying students at York College with high anxiety towards mathematics be examined in order to entice these students into taking the mathematics clinic.

Recommendation. Further research be conducted through visits to other colleges with mathematics clinics and experimentation with the material presented in the mathematics clinic.

The research concerning the differences in attitude, ability, avoidance and anxiety towards mathematics as related to sex is supported by this research. Of the original 44 participants, 38 were female. This lack of a solid background in mathematics for females serves to disqualify females from many professions as was previously pointed out in the review of the literature. Patricia Santleman (1976) concludes an article in which she attacks this problem by writing:

> If todays young woman is to have a share in the top careers of the future, she must know mathematics. For mathematics is a symbolic way of dealing with physical reality, a way which cuts across the barriers of language and, thus, the barriers of time. Arithmetic measures the dry ingredients for baking. Mathematics charts the oceans and explores the heavens. If a girl is content with the world of the kitchen, then she needs only arithmetic. If she wants to figure in the world of the future, she had better learn its language.

Recommendations

The following is a summary of the recommendations given in the previous section:

1) Further research should be conducted to find methods of attracting more freshman to the mathematics clinic without jeopardizing the attendance of the adult learners.

2) Further research should be conducted to examine how the attrition rate can be reduced.

3) Future clinics should continue to use field trips and local tours where possible to increase awareness for the applicability of mathematics.

4) Future clinics should continue to use small class size and informal social interactions.

5) The mathematics clinic be permanently established at York College.

6) Methods of identifying students at York College with high anxiety towards mathematics be examined in order to entice these students into taking the math clinic.

7) Further research should be conducted through visits to other colleges with mathematics clinics and experimentation with the material presented in the math clinic.

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APPENDIX I

MATH ATTITUDE SCALE

NAME _____ DATE _____ SCORE _____

Please indicate the extent of agreement your personal feelings toward math have with each of the following statements by writing a number from zero to four in the blank to the left of each statement, indicating:

0 = strongly disagree
1 = disagree
2 = undecided
3 = agree
4 = strongly agree

You may wish to use the reverse side of this sheet to describe your past experiences with math, your current feelings toward math, and your future hope for your relationship with math, including what you feel a clinic, workshop, or math class should or should not encompass. Thank you.

____ 1. I am always under a terrible strain in a math class.

____ 2. I do not like math, and it scares me to have to take it.

____ 3. Math is very interesting to me, and I enjoy math courses.

____ 4. Math is fascinating and fun.

____ 5. Math makes me feel secure and at the same time it is stimulating.

____ 6. My mind goes blank and I am unable to think clearly when working math.

____ 7. I feel a sense of insecurity when attempting math.

____ 8. Math makes me feel uncomfortable, restless, irritable and impatient.

____ 9. The feeling that I have toward math is a good feeling.

____ 10. Math makes me feel that I'm lost in a jungle of numbers & can't get out.

____ 11. Math is something which I enjoy a great deal.

____ 12. When I hear the word math, I have a feeling of dislike.

____ 13. I approach math with a feeling of hesitation, resulting from a fear of not being able to do math.

____ 14. I really like math.

____ 15. Math is a course in school which I have always enjoyed studying.

____ 16. It makes me nervous to even think about having to do a math problem.

____ 17. I have never liked math, and it is my most dreaded subject.

____ 18. I am happier in a math class than in any other class.

____ 19. I feel at ease in mathematics and I like it very much.

____ 20. I feel a definite positive reaction to math; it's enjoyable.

APPENDIX II

Is "pi" Greek to you?

Do fractions frighten you?

Is "math" a dirty four-letter word to you?

Does the sight of $a^2+b^2=c^2$ make you ill?

If so, it's time to re-charge your Force!

Get positive thoughts about negative numbers.
Sneak up behind a word problem and get a ½ nelson on it.
Be ready for any math or statistics course
that is in your future

Enjoy a series of meetings in a classroom
without the tensions and pressures of tests and grades.

Come to the MATH CLINIC

at York College of Pennsylvania - one night a week*
Lower level of the Library, Room L-6
Beginning the week of Jan. 23, Ending week of Feb. 27, 1978

Return this form to:

Mrs. Bickleman
York Hall - York College of PA
Country Club Road
York, PA 17405
Phone 846-7788, ext. 333

Please register me for the MATH CLINIC -

Name _____
Address _____
_____
Zip code

I prefer
__Tuesday evenings
__Wednesday evenings
__Either will be all right.

*The evening will be announced when forms have been tabulated.

Free! Free! Free! Free! No charge!

APPENDIX III

MATH ANXIETY CLINIC

SYLLABUS

JANUARY 1978

I. First Meeting

A. Distribute syllabus
B. Distribute and collect Math Attitude Scale
C. Discuss topics: math anxiety, sex bias
D. Teacher suggested practice: patterns, including networks, sequences
E. Statistic of the week...spending in higher education.
F. Joke of the week
G. Puzzle of the week: donkeys*
H. Format samples*
I. Student suggested practics
J. Assignment: bring scissors, ruler, tape, calculators

II. Second Meeting:

A. Discussion topics: rigor, estimation
B. Film: I Do and I Understand
C. Teacher suggested practice: venn diagrams, truth tables, mobius strips
D. Statistics fo the week: consumer prices
E. Joke of the week
F. Puzzle of the week: dittoed cards*
G. Format samples*
H. Student suggested practice
I. Bring in a word problem: Assignment

III. Third Meeting

A. Discussion Topics: abstraction, mystery, scary
B. Film: Solving Verbal Problems in Math
C. Teacher suggested practice:distributive property, repeating decimals
D. Statistic of the week: Senator's ages
E. Joke of the week
F. Puzzle of the week: handcuffs*
G. Format samples*
H. Student suggested practice
I. Assignment: bring in a (science) joke

*can be out of class

IV. Fourth Meeting

A. Discussion topics: mathematics symbols
B. Film: Classical Antics in Math
C. Teacher suggested practice: graphing, Pythagorean theorem.
D. Statistic of the week: prices you pay
E. Joke of the week
F. Puzzle of the week: equivalent fractions*
G. Format samples
H. Student suggested practice
I. Assignment: bring puzzles, games, eg., soma boss

V. Fifth Meeting

A. Discussion topics: test-taking, grades
B. Film: Games, Puzzles and Logic
C. Teacher suggested practice: probability, Hanoi tower
D. Statistic of the week:
E. Joke of the week
F. Puzzle of the week: counterfeit coins*
G. Format samples*
H. Student suggested practice
I. Assignment: Evaluations; "bring in" discussion topic

VI. Sixth Meeting

A. Discussion topic:
B. Student suggested practice
C. Statistic of the week: see library
D. Joke of the week
E. Puzzle of the week: aptitude test
F. Assignment: hand in evaluation; retake Math Attitude Scale

*can be out of class

APPENDIX IV

Raw Data

Participant	Age	I.Q.	Pretest	Posttest	Diff
1	36	114	33	39	6
2	49	107	8	15	7
3	28	126	46	48	2
4	55	99	56	56	0
5	26	112	32	36	4
6	55	110	64	66	2
7	39	111	25	31	6
8	35	122	45	49	4
9	41	109	25	31	6
10	41	129	20	29	9
11	44	117	19	18	-1
12	23	132	23	27	4
13	47	126	6	21	15
14	58	92	0	5	5
15	44	91	5	5	0
16	18	127	15	18	3
17	42	107	28	45	17